

## **Boracic acid in surgery / by William Warren Greene.**

### **Contributors**

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CONTRIBUTIONS TO CLINICAL  
SURGERY.

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BORACIC ACID IN SURGERY.

BY

WILLIAM WARREN GREENE, M. D.,

PROFESSOR OF SURGERY IN THE MEDICAL SCHOOL OF MAINE; SURGEON TO THE  
MAINE GENERAL HOSPITAL.

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## BORACIC ACID IN SURGERY.

BY WM. WARREN GREENE, M. D.,

*Professor of Surgery and Clinical Surgery in the Medical School of Maine ;  
Surgeon to the Maine General Hospital, etc.*

FOR several years past I have used the boracic acid more or less in my surgical practice, but it was not until a little over three years ago that I determined to give it a thorough trial. I first used it in the treatment of certain obstinate, unhealthy ulcers, and it was from observation of its action in this class of cases that I was led to test its qualities more extensively. For certain reasons I have preferred to confine its exhibition to private practice exclusively, not having, up to date, used it probably a dozen times altogether in the hospital.

This trial has been sufficiently extensive and thorough to warrant somewhat definite conclusions as to the merits of the drug, and, convinced as I am that in it we have a remedial agent of much greater power and wider range of applicability than members of our profession are aware, I desire to put in concise form a statement of my clinical experience with it. Indeed, very little is generally known of this article.

True, Mr. Lister has used it in the treatment of "foul sores," and lint steeped in a hot solution of boracic acid forms a part of his antiseptic dressing. Mr. Watson has testified to its value in his East India practice, and Dr. Hussmann, of Germany, and a few others have given evidence in its favor, while a second and careful reading of Poli's published account of his investigations from a chemical stand-point more especially prepossessed me in its favor. Nevertheless, it is

not even named in any of the older text-books, and is very briefly noticed in few of the more modern ones, while the little that has been written of it in periodical literature has not attracted general or marked attention. So that I am warranted in saying of the large majority of medical men, that they have no familiar or practical acquaintance with this important therapeutic agent.

I shall not occupy time or space with a tedious detail of individual cases, but content myself with a brief statement of facts, and my own conclusions therefrom.

#### TOPICAL USE.

Although, as will be seen further on, I have administered the acid internally to considerable extent, yet I have for the most part used it as a topical remedy, and it is to the results of its local application that I especially invite the careful attention of my professional brethren.

The first instances in which I employed boracic acid as a dressing were *old, indolent ulcers following severe burns*; and I wish to call particular attention to three of these cases, each one of which presented typical features.

One had a glazed, dark, tender surface, with considerable induration of base and edges, a scant, watery discharge, with entire absence of granulations. The surface of the second sore was a mass of large, flabby granulations, bathed in unhealthy puriform fluid; while the third ulcer was exceedingly tender and painful, covered with foul flecks and shreds of aplastic inflammatory products, and discharged freely a thin, ichorous, fœtid matter, which was often mingled with dark blood. Having stated that the ulcers were old, I hardly need to say that the usual methods of treatment in such cases had been previously employed, and had failed.

Under the action of the acid marked improvement took place with a promptitude not to be explained as

mere coincidence. The glazed surface became less irritable, and within a week was covered with an abundance of healthy granulations. In the other sores, unhealthy discharge gave place to laudable pus, granulations became normal, and in each case the process of cicatrization was established.

Since this first trial I have treated a large number and a great variety of sores, both simple and specific in origin, with the acid, and with quite uniform results. These results have been an immediate correction of unpleasant odor, relief of pain or itching sensations, and an improvement in the granulation process. An important fact in this connection is that in all the cases treated, either other plans of treatment had been fairly tried, or, as in a few cases treated by the acid applications from the first, were observed in comparison with similar ulcers which were being managed by some one of the time-honored methods.

Under the influence of this remedy the tissues become better fitted for the reception and<sup>a</sup> nourishing of skin-grafts, while those that have taken but indifferent hold, and give doubtful promise, brighten and quicken under the vivifying contact of boracic acid. The mode of its application will be given further on.

In several fresh, open wounds of large area, I have followed the primary dressing of cotton wool with the boracic-acid ointment, and with most satisfactory results. For example, two weeks ago I removed a large scirrhus breast, to which the infected, leathery skin so closely adhered as to require removal with it. Hence the surface of the resultant open wound was a little more than equal to the base of the mammary gland. Under the boracic acid dressing the sore is perfectly healthy, and already new skin is rapidly pushing in from the edges.

In simple catarrhal inflammations of mucous surfaces, as well as in the ulcerative forms of disease associated with fœtid, muco-purulent secretion, the effect of boracic acid solutions has been most gratifying. In



ozœna and otorrhœa I have proved its quality as a prompt deodorizer and healthful alterative, and as a lotion for washing out the bladder in chronic cystitis with muco-purulent and offensive urine, I know of nothing better. I have employed it as an injection in twenty-eight cases of gonorrhœa, and I never had similar cases do better under any other treatment. I have been equally pleased with its effect in vaginitis and inflammation of the external genitals of the female.

I have had but limited experience with it in genuine diphtheria, but in the few cases where I relied upon it as the local remedy, I have been abundantly satisfied; and in diphtheroid and aphthous inflammations of the fauces, I have convincingly tested its action and demonstrated its value.

In the form of a lotion or ointment it has proved efficient in erythema and facial erysipelas; and in a variety of skin diseases, especially eczema and the various forms of tinea, the use of the acid has been uniformly either curative or markedly palliative and beneficial.

As the writing of this article recalls a large number of individual cases, I am strongly tempted to report many of the more striking ones, but I forbear. One case, however, still under treatment, so forcibly illustrates the value of this remedy from a comparative stand-point, that I feel sure a brief notice of it will be profitable.

About the first of last June a lady came under my professional care who, eight months before, had sustained severe burns upon both upper extremities, with several patches upon the chest. Both arms were deeply burned over three fourths of their surface, as was also the fore-arm of the right side. The left fore-arm was badly burned in its upper third, the lower portion escaping. During all these months she had been in charge of one of our most skillful physicians, who, to my personal knowledge, had exhausted the list of ordinary remedies in such cases, both lotions and ointments. Acetate of lead, sulphurous acid, simple cerate,

cocoa butter, bismuth and glycerine, zinc ointment, etc., had been applied without avail. The failure to heal was finally attributed, as I understand, to pregnancy, and the hope entertained that after labor the process of cicatrization would begin. On the contrary, after delivery, which was natural and prompt, she failed faster than before, and one month subsequent to the birth of her child I found her in a most pitiable and unpromising condition. The ulcerated surfaces were terribly painful and irritable, and covered with a very offensive aplastic matter, which was abundantly secreted, with dark blood oozing freely from various points, and an entire absence of proper granulations. The slight attempts at new skin-formation reported to have occurred at times during the past winter had left no trace, but instead, all along the edges were unhealthy sores, secreting foul ichorous fluid. In short, the surfaces were as unpromising in appearance as they could well be after so long continued and fruitless trial of remedies. Her general condition was correspondingly bad. She had well pronounced hectic fever, loathed all food, and had a troublesome cough, which, in view of family tendencies towards phthisis, gave me unpleasant apprehensions. Indolent pustulations here and there over the body, sore eyes and lips, wandering pains, and a constant elevation of temperature told of serious blood poisoning. Scores of grafts had been inserted, but all failed.

The sores were kept constantly soaked in a saturated watery solution of boracic acid under oiled silk, until in three days the surfaces were clean. I then substituted the ointment containing a drachm of the acid to the ounce, which has constituted the dressing ever since. The change has been, to speak moderately, most remarkable. To be sure, I put her simultaneously upon a tonic and supporting plan of general treatment, but the local changes were too great and sudden to allow the faintest suspicion even that they were not due to the local treatment. So marked was

the improvement in every way, that even the attendants, *from the first*, noticed it *from day to day*, and exclaimed with astonishment. To-day the surfaces are everywhere healthy, secreting a moderate amount of laudable pus. All pain is gone, and both marginal and central cicatrices are rapidly forming. Already, in some places, patches of new skin measure by inches, and only eight weeks have elapsed since the acid treatment began.

The hectic is entirely gone, temperature normal, appetite excellent, cough has disappeared, as have the unhealthy mucous and tegumentary inflammations and wandering pains, and she is rapidly gaining strength. One most distressing symptom was an almost continual "throbbing" in the arms, which at last extended all over the body, and caused her great suffering. This long ago disappeared.

But after all, this statement must, in all fairness, be accompanied by another, which only shows how careful we must be in passing judgment on a new therapeutic agent or plan, and how necessary it is to consider all the circumstances in each case.

For five or six months previous to my assuming the care of her, and in order to prevent the contraction that was dreaded as a probable contingent of the healing process, she had been in the habit of daily exercise of the limbs by forcible flexion and extension, pulling on ropes, etc. This performance, to use her own language, "gave perfect torture at the time and increased pain and soreness, often with bleeding, for hours afterward." But being fully convinced of its necessity, and possessing wonderful courage, she persisted in the practice in spite of the suffering. Now, one of the first things I did was to put the arms at rest, and to this end I constructed baskets or cradles of wire webbing nicely padded with oakum, in which the limbs find even support, and these, being suspended by elastic cords and pulleys, give grateful and perfect rest to the suffering members. I need not say that in es-

timating the treatment as a whole, this element of even, elastic support, and absolute rest, must be credited for whatever it is worth. Making, however, allowance for all possible influence from this source, the evidence is most convincing to my own mind that boracic acid has been the principal factor in the curative process.

#### INTERNAL ADMINISTRATION.

My experience with this drug as an internal remedy has been comparatively limited. I have, however, sufficient proof of its value to warrant reporting my observations.

Let me state in this connection what I think is a very important fact. In all the trials of boracic acid upon which this paper is based, I have used it, whether internally or topically, *alone*. So that, aside from the vehicles of its administration, my conclusions are not embarrassed by the possible concomitant action of other remedies.

In a few cases of diphtheria and in many instances of tonsilitis and diphtheroid throat affections, that is, in cases characterized by pain, swelling, and dark color of the fauces, with fœtid breath and adynamic fever, yet lacking the distinguishing sub-epithelial exudatè, the acid treatment has proved very satisfactory.

In chronic dyspepsia with fœtid eructations decided improvement has immediately followed its exhibition.

In two cases of chronic cystitis, instead of using it topically in washing out the organ, and with no topical treatment, I have given it by the mouth with undoubted good effect. In cases of inflamed or irritable prostate its free internal administration has given results corresponding with those obtained in the management of mucous inflammation.

In septicæmia I have sufficient reason to give it great confidence.

In pyæmia and rheumatism, I have not improved opportunities for trying it sufficiently to warrant a de-

cided opinion, but only to justify me in asking for it a trial at the hands of my professional brethren.

From its beneficial action upon syphilitic ulcers and eruptions, I can but hope that it may prove a valuable remedy in general syphilis. But I have not as yet put it fairly on trial in this disease.

#### GENERAL REMARKS.

Boracic or boric acid is a compound of boron and oxygen, and is obtained principally by decomposing the borate of soda or borax with sulphuric acid, which, having a stronger affinity for the soda, unites with it, forming the sulphate of soda, displacing the boracic acid. The supply is therefore abundant and its manufacture cheap, hence it is sold at wholesale for from forty to fifty cents per pound. It occurs in white scaly crystals, which, in their glistening appearance and peculiar saponaceous feel under trituration, resemble somewhat those of benzoic acid. It is odorless and almost tasteless and gives colorless solutions. It is peculiar as to solubility. Cold water dissolves only nineteen grains + to the fluid ounce, and hot water dissolves eighty grains to the ounce, but on cooling precipitates all but twenty-three grains, while alcohol holds only a fraction more than hot water. Hot glycerine, however, dissolves a little more than three drachms to the fluid ounce, and *holds it perfectly on cooling.*

I am aware that a certain most worthy author makes the following statement: "It" — boracic acid — "is soluble in twenty-six parts of cold and in three parts of warm water, and is freely soluble in alcohol." I do not understand this remarkable and certainly mistaken statement. For my own statements as to solubility I am indebted to my friend, Mr. William J. Bragdon, an excellent young pharmacist of this city, who has kindly interested himself in the matter, and whose experiments I have repeatedly witnessed; and although the results are not absolutely accurate, as such precision was not essential for my purpose, they are to my

personal knowledge approximately correct, and sufficiently so for practical use. Vaseline, cold or hot, does not affect the acid, but at high temperature unites readily with the saturated glycerite, and the union remains perfect on cooling without any precipitation.

As to doses for internal administration I do not know the limit. It is a curious drug. Locally, although so decided an antiseptic, and powerfully alterative, yet a saturated watery solution does not in the least irritate a fresh cut surface. Nor does the same solution, which I have said is almost tasteless, having only the slightest saline flavor with a suspicion of acidity, in any way disturb the stomach. I have repeatedly given four fluid ounces of saturated solution as a dose, which contain about eighty grains of the acid, and in several instances patients have taken much more. I have never known any ill effect from it in any way. My ordinary dose for an adult is from twenty to thirty grains, but when I desire prompt saturation of the system I give from one to two drachms every four hours. In internal exhibition I have used it only in aqueous solution or in powder, — given usually in cachets, — directing the patient to drink water freely immediately afterward. There could be no objection to giving the glycerine solution in certain cases; but it is to be borne in mind that the addition of water, and of course the same would happen in the stomach if water was taken subsequently, will precipitate the acid.

It is of its local use that I speak most confidently. As a topical remedy I have applied it in form of solution, — I have preferred to confine myself to the watery and glycerine solutions, as it is difficult to differentiate the action of the alcohol from that of the acid, — both aqueous and glycerinous, and in ointment. For continued application the latter is best. My plan is in a general way the following: In foul sores, simple or specific, whether ulcers or eczematous or ecthymatous surfaces, I keep the parts soaked in the aqueous solution, or, if very foul and unhealthy, in the saturated

glycerite of boracic acid, for a few days, until the surfaces become clean and free from foul odor. I then dress with the boracic acid ointment. In very indolent sores the occasional free brushing or sopping with the glycerole as the ointment is renewed is advantageous.

In the treatment of erythematous or erysipelalous inflammations the application may be by wet compresses under protective dressing or by the ointment. In gonorrhœa and cystitis I have used the saturated watery solution, except in a few cases of obstinate urethritis in which I employed the acid glycerole with excellent effect. In diphtheria and diphtheroid affections I have generally used the full strength of the glycerine solution.

In preparing the ointment I have used vaseline as the basis, adding a little wax or spermaceti, or both, if a firmer mixture is desirable. As I have before said, the vaseline does not dissolve it, but properly prepared the acid is so finely levigated and intimately and evenly mixed that its thorough contact with any surface is insured. I have, however, lately made the ointment directly from saturated glycerite. Cold vaseline and glycerine will not mix, but at a high heat it unites perfectly with the glycerole, and forms a permanent union when cold.

For example, take saturated glycerole of boracic acid two parts, spermaceti and white wax each one part, vaseline six parts. Melt vaseline, wax, and spermaceti together, and add the glycerole slowly with trituration while cooling. This makes a dressing of ordinary strength, and is a *most beautiful pharmaceutical preparation*. Of course the strength may be increased indefinitely. Under such dressing, which never adheres to the raw surface, granulations prosper, skin grafts thrive, bad odors cease, and pain and irritation rapidly diminish.

I want to say a word here, parenthetically, about vaseline.

I have said that I have always employed it in mak-

ing boracic-acid ointment. I will also say that for a long time I have used it altogether as the base of all unguents whatever, merely adding a little white wax or spermaceti if I desired more firmness. I doubt if physicians generally are aware of the excellence of this wonderful product of petroleum distillation. Odorless, perfectly bland, in itself a most grateful and wholesome protective dressing, it is stable under all ordinary temperatures, is not affected by morbid secretions or by chemicals, and never becomes rancid or changed in density by age or exposure. With these qualities, and without a single feature that is objectionable, it can but commend itself at once as a substitute for all fats or oils in pharmacy. And the surgeon cannot realize the comparative advantage in comfort and neatness, both to himself and to his patient, until he tries it. If in haste and the hands are covered with it, a thorough wiping with a dry towel will make them practically clean for work in an emergency, and freedom from any odor is not a slight point in its favor.

I have for dressing purposes every ointment of the pharmacopœia in my office, all made with it, and I feel sure that if any surgeon is led by this statement to make trial of it as a substitute for grease he will thank me for this brief testimony for vaseline.

It may be truly said that the ointments of vaseline, wax, and spermaceti are of themselves good and oftentimes sufficient dressings in the management of ulcerated and inflamed surfaces. In all my testing of the qualities of boracic acid I have not for a moment forgotten this fact, nor have I overlooked the action of glycerine. It is important to remember that glycerine is one of those topical remedies with regard to which there are many idiosyncrasies, and that to many sores where it would seem indicated it is a most powerful and distressing irritant. Not only is this true, but in the same case its action is so modified by otherwise unappreciable changes in the disease that careful watching alone will enable the surgeon to use it at the right



time and in the right place. What I have said of the action of the acid is from careful observation with all these facts constantly in mind.

I believe I have not spoken extravagantly. If in one or two instances my language is emphatic, it is because the facts warrant it. I do not pretend to anything like a full knowledge of the indications for its use or of its therapeutic power, especially as an internal remedy. As a topical application I have yet much to learn as to its power, range of adaptation, and the desirable degrees of strength and modes of combination in different cases and under different circumstances. But I know already that it is a medicine deserving high rank in the materia medica as a disinfectant, parasiticide, anti-ferment (a saturated (watery) solution surely destroys all germs), and a most excellent alterative to unhealthy surfaces, correcting unhealthy processes of inflammation and ulceration, and promoting the exudation and organization of sound lymph. And I sincerely trust that my professional brethren throughout the world will so thoroughly test its virtues as to give it its definite and deserved place in the pharmacopœia. Fortunately its cheapness, its freedom from all unpleasant taste or odor, its stability, and its lack of any irritating or poisonous quality, at least within the limits of ordinary doses, render such trial very easy and safe.

PORTLAND, *July* 26, 1880.

## SUPPLEMENTARY NOTE ON BORACIC ACID.

SINCE the paper "Boracic Acid in Surgery" went to press certain facts have come to my knowledge which, though they may seem comparatively trivial, I yet desire to record as a sort of addendum.

While I was experimenting two days ago with boracic acid, Mr. Frank L. Bartlett, of this city, chemist and state assayer, came in, and on learning what I was handling made the remark, "It is very strange that so little is known of so remarkable a substance." He then informed me that he had experimented with it extensively in a quiet way, and I was gratified to find that his results and conclusions entirely coincided with my own views and with my knowledge, so far as I had investigated from a chemical stand-point. Mr. Bartlett's investigations have been in the same direction as Poli's, whose paper he had not seen or heard of; but his experiments were equally decisive, and his testimony to the efficacy of boracic acid as an anti-ferment, antiseptic, and preservative is quite as positive and convincing.

He — Bartlett — has found fresh meats, butter, vegetables, etc., perfectly preserved for an indefinite length of time by simply covering them with cloths wet in a solution containing only ten to fifteen grains of the acid to the ounce of water.

*When we remember that boracic acid is innocuous, odorless, and practically tasteless, it seems to me that such facts should arrest marked attention.*

I cannot avoid the suspicion that if great cost, offensive odor or taste, or any other striking peculiarity of a common character had obtruded it upon our notice, it would have ere this received much more consideration.

Mr. Bartlett's remarks brought to mind one fact that I intended to state in my main paper, but I forgot it, namely, that I have used to a considerable extent a combination of boracic and salicylic acids, both internally and externally, and while I am not prepared to claim any advantage from such union in any case, yet I think it desirable to test its quality in varying proportions, more especially as an internal remedy. The two solutions may be mixed, or the two crystallized acids may be fused at a high heat, forming a soluble boro-salicylic acid.

Again, in speaking with my friend E. Dana, Jr., of this city, a most excellent and widely known pharmacist, he suggested the substitution of cocoa butter for wax and spermaceti in making the boracic acid ointment, for the reason that wax is not only insoluble, but does not melt at the heat of the body, while cocoa butter does. For some cases, where adherence to the surface is unobjectionable, this is a good plan; but the value of the wax is not only to give firmness, but to prevent sticking to the sore surface, which, mixed with vaseline, it does entirely. After considerable trial I have come to the following conclusions:—

(1.) In cases where an aqueous solution of the acid is not needed, or after its sufficient primary use, an ointment is the best form for continuous application.

(2.) In cases where it is especially desirable to avoid any adhesion of the dressing to the diseased surface the following is the best formula:—

R̄ Glycerit. acidi boracici sat. <sup>1</sup>	. . . . .	f℥ij.
Ceræ albæ		
Cetacei . . . . .		āā ℥i.
Vaseline . . . . .		℥vi.

Melt the last three together, and add the glycerite with trituration. S. *Unquentum acidi boracici.*

Where it is essential to make the application as thorough as possible, an excellent method that I often

<sup>1</sup> It will be remembered that hot glycerine dissolves over three drachms of the acid to the ounce, and holds it perfectly on cooling.

employ is to apply either the glycerite of the acid freely to the surface each time immediately before renewing the ointment, which may be done with a camel's-hair brush or by sopping; or if the glycerine is objectionable apply a mixture of pure vaseline with the glycerite (prepared by melting the vaseline, of course) of such strength as is desired, which mixture is soft enough to manage easily with a brush. Then the ointment, spread on some proper material, — there is nothing better than nice sheet lint, spreading on the soft side, as it holds so much and so firmly, — is applied over all.

If, however, adhesion is unobjectionable, as in non-suppurating or slightly secreting sores, requiring infrequent dressing, the following is excellent: —

R̄ Glycerit. acidi boracici sat.	f℥ ij.
Butyr. cocoæ	℥ ij.
Vaseline	℥ vi.

Melt the vaseline and butter together, then add the glycerite with trituration.

It is well to know that this last preparation requires a long time comparatively — twenty-four hours at least — to cool, or rather harden to its *maximum*.

On the whole, I think the first formula — which is the one published in the first paper — will stand as the representative *boracic acid ointment*, as that which will best fulfill all the indications in the majority of cases, especially when supplemented in the manner I have described with the glycerite or the mixture of pure vaseline and the acid. But in many instances I have no doubt that the second formula will prove an advantageous modification of the regular ointment.

I am aware that after all I have in this note called attention to and emphasized certain points in my original paper rather than brought out anything really new, and if I seem inclined to press my subject with some persistence upon the notice of the profession, it is because I believe it worthy of any degree of interest which I may be so fortunate as to awaken.

PORTLAND, August 30, 1880.





